CONCEPTUAL APPROACH TO PATHOGENESIS AND SURGICAL TREATMENT OF GASTROESOPHAGEAL REFLUX DISEASE

The article urges that absence of Gubarev’s valve is the key factor of pathogenesis of gastroesophageal reflux disease (GERD). Authors suggest operative technique of the valve reconstruction in a posterior mediastinum for the patients with GERD, associated with cardiac hiatal hernia. The method did not cause complications in the form of postoperative dysphagia and recurrence of disease in the long-term periods.

Keywords: GERB, pathogenesis, surgery

UDC: 616.329

Introduction

The lower esophageal sphincter (LES) of healthy people is in a rest condition for about 23 hours in a day and restrains the stomach contents from the casting into the esophagus. However, during the day rest tonus disappears 20-30 times for 20-30 seconds due to the physiological relaxation of the LES. Residual tonus remains, however, it is insufficient to restrain intragastric pressure (Kolesnikov, 2000). The valve of Gubarev (GV) helps to control in normal health state. VG is absent in people with hiatal hernia and congenital short esophagus. The Angel of His (AH) forming a cape in the lumen of the stomach with hanging fold of mucous membrane, which is the VG under an esophageal-gastric junction, is smoothed, so gastroesophageal reflexes occur during spontaneous relaxations of LES (Sheptulin et al., 1995; Holloway, 1999). Their aggressive components damage the mucous membrane of the distal esophagus, submucosal layer causing fibrosis, and the LES. Physiological relaxations of damaged LES become more frequent and long, time of transition from the state of relaxation to the rest tonus and back is increased, up to cardiac gaping (Hornby and Abrahams, 2000). Accordingly, the frequency and the massiveness of reflexes, length of stomach content staying on the mucous membrane of the esophagus is increased (Holloway, 1999). The pathogenesis circle of GERD is closed.

National morphologists note the presence of auxiliary elements in the form of folds of mucous membrane and vascular structures in the sphincters of gastrointestinal tract, capable of performing the function of leaflets (Efimov, 1994; Kalinin, 2003; Sheptulin et al., 1995). Normally, such a role is played by the fold of mucous membrane, hanging from the cape, formed by AH in the lumen of stomach.

The processes occurring in the layers of the distal esophagus under the influence of aggressive components of stomach content lead to deformation and fibrosis. The mucous membrane loses its ability to form folds; therefore, after the re-establishment of acute AH by stitching the right side of the stomach fundus to the left wall of distal esophagus, there is no formation of sealing the folds of mucous membrane under the esophageal-gastric junction. First, Lortat-Jacob (1950) executed this operation from thoracic access and did not attain the desired result. In 1951, English surgeon Allison suggested that the basis of hiatal hernia is not anatomical, but functional defect in the cardia. Possibly, he was near to solution of key factor of pathogenesis of GERD, but the article of R. Nissen: “Simple operation of antireflux” (Nissen, 1956) created for many years the mistaken picture of key factor of pathogenesis of GERD. The essence of its operation is to downgrade a hernia...
under a diaphragm, winding the cuff of the stomach fundus round the distal esophagus; this procedure recreates the sharpness of AH, increases the pressure in the lumen of the LES (Hornby and Abrahams, 2000). This operation became popular in the world, all physicians expected a high efficiency from this approach. However, the overwhelming disadvantage lays in the essence of the operation. Creation of cuff from the stomach fundus does not have anatomical and physiological basis. This is confirmed by postoperative dysphagia in 40% of cases, recurrence of hernia and GERD (Kharilas et al., 2000). The patients with gastroesophageal reflux disease have often the reduced peristaltic activity of the esophagus; therefore, that the distal cuff around his department creates dysphagia.

Faced with the shortcomings of this operation, surgeons started offering its modification with cuffs in 180 and 270 degrees. These cuffs create less postoperative dysphagia, but relapses of hiatal hernia and GERD occur frequently. Repeated operations do not provide the optimal results in terms of recovery from GERD, they are often accompanied by severe complications with postoperative mortality of 17%.

Despite the failure of the concept of the GERD pathogenesis, it was approved by the World Gastroenterology Week in Berlin in 1995. The positive side of this forum was the adoption of GERD as a new nosological unit; it was introduced to WHO list of diseases of the 10th revision (ICD-10).

To understand the causes of inefficiency Nissen operation and its modifications, it is important to realize the factors leading to such consequences.

In women, the average length of the esophagus is 24 cm. In patients with cardiac hiatal hernia the esophagus is shortened due to migration (1 cm) of its part, placed in a ring of esophageal opening, abdominal section (3 cm) and gastric cardia (3 cm) to the posterior mediastinum. Therefore, esophageal-gastric junction is moved up by at least 7.0 cm, and the esophagus is decreased from 24 cm to 17.0 cm. As time passes it becomes adapted to this length. To create a cuff Nissen below the diaphragm, the esophagus has to be lengthened to 12-15 cm, or 50%-70% of the actual length. However, the esophagus responds with tonic spasm of the longitudinal muscles, which muddle through or destruct the cuff. As result, the overlaid tight cuff creates dysphagia, and GERD relapse. We have never been able to find signs of cuff in patients operated by Nissen after 1-3 years when GERD recurrence required repeated operation.

The followings arguments serve as foundation for the AH reconstruction above the diaphragm: 1) axial hernia of the esophageal opening of diaphragm does not render direct adverse effects on the organs of mediastinum 2) it is never gets infringed. Consequently, there is no clinical motivation to fix it.

A. Zalewsky (2003) developed in 2001 a concept of GERD pathogenesis, the key factor of which is absence of AH. He developed the operative reception of valve recreation in a postmediastinum and successfully applied in clinical practice. Forming of valve is conducted without lengthening of esophagus and without creation of cuff from the fundus of stomach round the distal department of esophagus. Valve function is based on the phenomenon of moving elastic ring (or sphincter) relatively to small part of its circumference, fixed to a stable object.

**Surgical technique in patients with GERD from abdominal access, associated with cardiac hiatal hernia**

Upper median laparotomy is performed, the left lobe of the liver is mobilized and diverted, hernial departments of the stomach and esophagus are reduced under a
diaphragm, their back walls are mobilized, the front of the hernial sac is resected. Thread is put through the anteroinferior arc of LES using a stitch of 0.7-0.8cm; thread ends are fixed in clips. By finger introduced into the mediastinum the pericardium is peeled from the diaphragm for 4.5cm ahead and in the width of the esophageal ring. The ends of the yarn are carried out through the aperture of 2.5 cm from the front edge of the ring of the esophageal opening (Figure 1).

**Figure 1. Diagram of lead of filament through the front arc of LES and through a diaphragm from abdominal access**

An esophageal-gastric junction is transferred to the niche between a pericardium and diaphragm by pulling up the ends of the thread. Further linking the thread ends provides fixing of LES at anteroinferior arc above diaphragm. The operation administration is closed (Patent, 2003).

**Anatomical composition of valve**

The lower esophagus fits lowback oval of the right atrium at moving of esophageal-gastric junction forward; and hernia part of stomach fits the front edge of the esophageal opening ring in diaphragm: thus, hernia part of stomach is placed under an esophageal-gastric junction. The front hernia wall of stomach, lying on a diaphragm and fixed to it, performs as immobile leaf of valve. When LES is in rest or residual tonus, the opening of esophageal-gastric junction is in 2.5-3.0cm ahead from stomach entrance: it is closed and tightly ceiling from the bottom the fixed leaf. And the axis of lower department of esophagus is directed on the immobile leaf of valve. The back wall of the stomach hernia closes the entrance to the esophagus behind the esophagogastric junction (Figure 2).

The pressure in the lumen of LES increases due to intragastric pressure. During the act of swallowing under food lump pressure the back wall of LES and back hernia wall of stomach (folding leaf) depart back and transmit the food lump to a stomach (Figure 3). Followed it the LES reflexively reduces, moving to the fixed part of the circumference, leads esophageal-gastric junction behind the immobile leaf of valve. It keeps this position between food intakes, when LES is in rest tonus or state of physiological relaxation, and reliably stops content of stomach from reflux to esophagus.
Materials

Thus, instead of lost Gubarev’s valve in 39 patients with GERD, associated with cardiac hiatal hernia, the valve was created under the esophageal-gastric junction in the posterior mediastinum. Operative technique is simple, surgical trauma is minimal, resulting in the restoration of peristaltic activity of the gastrointestinal tract into the next day after surgery, the absence of dysphagia and other postoperative complications. In view of the valve anatomy, it is effective at any pressure LES.

Results and discussion
In terms of observations from 2 to 7 years 36 (92.3%) patients with GERD reached a full recovery after delivery of operations based on the described method. The criteria for recovery included: absence of GERD symptoms, endoscopic and histological evidence of reflux esophagitis, pH>4 in the esophagus for 24 hours a day, safety valve leaflets and their functions proved by X-ray method.

Conclusion

Cardial hiatal hernia does not adversely impact on the adjacent organs, does not make them infringed and does not create the clinical motivation to fix it. A key factor in the pathogenesis of GERD is the congenital absence or loss of the Gubarev’s valve in adult life.

The operative technique of valve reconstruction in the posterior mediastinum in patients with GERD is conceptually justified. The delivery technique is simple, involves minimal operative trauma, does not cause postoperative dysphagia, and disease recurrence in the long-term periods.

References


Kolesnikov, L., 2000. Sphincter apparatus of man [Sfinkternyj apparat cheloveka], in Russian, St. Petersburg

